



## SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application number:  
EP 17 74 20 18

### Classification of the application (IPC):

E21B 10/61, E21B 10/60, E21B 10/18, E21B 41/00, E21B 10/43, E21B 10/54

### Technical fields searched (IPC):

E21B

| DOCUMENTS CONSIDERED TO BE RELEVANT |   |                   |
|-------------------------------------|---|-------------------|
| Category                            | Citation of document with indication, where appropriate, of relevant passages                                       | Relevant to claim |
| Y                                   | US 3823789 A (GARNER L) 16 July 1974 (1974-07-16)<br>* column 3, lines 16-56; figures 2-5 *                         | 1-16              |
| Y                                   | US 2002148649 A1 (DICKEY WINTON B [US])<br>17 October 2002 (2002-10-17)<br>* paragraph [0042] *                     | 1-16              |
| Y                                   | US 4784231 A (HIGGINS DEAN T [US]) 15 November 1988 (1988-11-15)<br>* column 3, lines 17-37 *                       | 1-16              |
| Y                                   | US 3744581 A (MOORE R) 10 July 1973 (1973-07-10)<br>* the whole document *  | 1-16              |
| Y                                   | US 2010270086 A1 (MATTHEWS III OLIVER [US] ET AL)<br>28 October 2010 (2010-10-28)<br>* paragraph [0069]; figure 8 * | 1-16              |
| Y                                   | US 4723612 A (HICKS DUSTY F [US]) 09 February 1988 (1988-02-09)<br>* column 4, lines 12-26; figure 4 *              | 1-16              |

The supplementary search report has been based on the last set of claims valid and available at the start of the search.

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|---------------------------|--|-------------------------------|
| Place of search<br>Munich | Date of completion of the search<br>12 August 2019 | Examiner<br>Manolache, Iustin |
|---------------------------|--|-------------------------------|

### CATEGORY OF CITED DOCUMENTS

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|---|--|
| X: particularly relevant if taken alone   | P: intermediate document   |
| Y: particularly relevant if combined with another document of the same category | T: theory or principle underlying the invention                        |
| A: technological background   | E: earlier patent document, but published on, or after the filing date |
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## ANNEX TO SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application number:  
EP 17 74 20 18

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on 12-08-2019  
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| Patent document cited in search report |    | Publication date | Patent family member(s)  | Publication date   |
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| US 3823789                             | A  | 16-07-1974       | NONE   |  |
| US 2002148649                          | A1 | 17-10-2002       | US 2002148649 A1<br>WO 2004038165 A1   | 17-10-2002<br>06-05-2004   |
| US 4784231                             | A  | 15-11-1988       | NONE   |  |
| US 3744581                             | A  | 10-07-1973       | NONE   |  |
| US 2010270086                          | A1 | 28-10-2010       | US 2010270086 A1<br>US 2013160611 A1<br>US 2015167397 A1<br>US 2018044994 A1<br>WO 2010123953 A2 | 28-10-2010<br>27-06-2013<br>18-06-2015<br>15-02-2018<br>28-10-2010 |
| US 4723612                             | A  | 09-02-1988       | NONE   |  |